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ABSTRACT

The role that reading achievement tests play in the education of limited-English-proficient children makes it important to understand the relationship between these children's reading test performance and their literacy development. A study employed both quantitative and qualitative methodologies to identify factors that influenced the English reading test performance of 51 Hispanic children as compared to that of 53 Anglo children enrolled in the same fifth- and sixth-grade classrooms. In the statistical analyses, the children's reading test performances were compared in terms of the effect of time constraints, the children's prior knowledge of the passage topics, and the influence of the children's prior knowledge on their reading passage and question-type performances. As part of the qualitative analysis, 18 children participated in retrospective, open-ended interviews that focused on how they determined their vocabulary and reading test answers. The combined findings suggested that the Hispanic students' reading test scores seriously underestimated their reading comprehension potential. Their test performance was adversely affected by the range of test topics, the use of paraphrased vocabulary in the test questions and answer choices, their performance on the scriptally implicit questions, and their tendency to utilize a literal interpretation of the text to determine their test answers. The Hispanic children's interview responses about how they determined their answers and their responses to open-ended questions asked orally tended to elicit more information about their test passage comprehension than did their test performance. (Four tables are included; 62 references are attached.) (Author/PRA)

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CENTER FOR THE STUDY OF READING

Technical Report No. 539

FACTORS INFLUENCING THE ENGLISH READING TEST PERFORMANCE OF SPANISH-SPEAKING HISPANIC CHILDREN

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Abstract

The role that reading achievement tests play in the education of limited-English-proficient children makes it important to understand the relationship between these children's reading test performance and their literacy development. Both quantitative and qualitative methodologies were employed to identify factors that influenced the English reading test performance of 51 Hispanic children as compared to that of 53 Anglo children enrolled in the same fifth- and sixth-grade classrooms. In the statistical analyses, the children's reading test performances were compared in terms of the effect of time constraints, the children's prior knowledge of the passage topics, and the influence of the children's prior knowledge on their reading passage and question-type performances. As part of the qualitative analysis, 18 children participated in retrospective, open-ended interviews that focused on how they determined their vocabulary and reading test answers. The combined findings suggested that the Hispanic students' reading test scores seriously underestimated their reading comprehension potential. Their test performance was adversely affected by the range of test topics, the use of paraphrased vocabulary in the test questions and answer choices, their performance on the scriptally implicit questions, and their tendency to utilize a literal interpretation of the text to determine their test answers. The Hispanic children's interview responses about how they determined their answers and their responses to open-ended questions asked orally tended to elicit more information about their test passage comprehension than did their test performance.

FACTORS INFLUENCING THE ENGLISH READING TEST PERFORMANCE OF SPANISH-SPEAKING HISPANIC CHILDREN

Although evaluators and researchers have argued against overrelying on reading achievement test scores for student placement and assessment purposes (Johnston, 1981, 1984; Royer & Cunningham, 1981), this practice still occurs in many school districts (Aronson & Farr, 1988; Haney, 1985; Pearson & Valencia, 1987). In fact, guidelines for federally funded programs frequently require that reading achievement tests be used to determine student eligibility and program effectiveness (Haney, 1985). Such tests especially play a role in bilingual education programs, where they are used to measure children's progress, to determine when children should be exited from the program, and to evaluate the effectiveness of the program itself (Bennett, 1987). Outside of the school context, reading test scores continue to be used by researchers as a performance proxy to determine the effectiveness of instructional approaches (e.g., Anderson, Wilson, & Fielding, 1988; Wilkinson, Wardrop, & Anderson, 1988; Willig, 1985) and to investigate the relationship between school achievement and background or educational variables (see Durán, 1983; Willig, 1985).

The continued role of these tests in the education of limited-English-proficient (LEP) children underscores the importance of understanding the relationship between the children's reading test performance and their literacy development. The relatively low reading test performance of Hispanic children in the American educational system (Applebee, Langer, & Mullis, 1987) should motivate researchers to investigate the reading development, instruction, and assessment of LEP children both in and out of the bilingual setting.

The objective of this study is to describe how Spanish-speaking Hispanic students enrolled in all-English medium classrooms respond to the types of expository test passages and questions that frequently characterize English reading achievement tests. Expository test passages are the focus of the study because the differential in reading test performance between Anglo (non-Hispanic white) and Hispanic children tends to surface at the fourth-grade level (Applebee, et al., 1987), a time when most children are expected to learn from text (Chall, 1983).

Research in both second- and first-language reading and in second- and first-language testing suggests a number of factors that may influence the English reading test performance of LEP children. Although few second-language studies have looked at the role of prior knowledge in second-language children's reading, first-language reading studies have indicated that prior knowledge of passage content is a variable that can account for a significant proportion of children's reading test score variance (Johnston, 1984; Marr & Gormley, 1982; Pearson, Hansen, & Gordon, 1979). Cross-cultural studies already have documented the differential effect of cultural schemata on the inferential and literal comprehension of first-language children (Barnitz, 1986; Lipson, 1983; Reynolds, Taylor, Steffensen, Shirey, & Anderson, 1982). Hudson's (1982) work with adult English-as-a-second-language learners who were proficient readers in their native language also revealed that their reading comprehension performance in the second language improved when they were provided with the appropriate background knowledge needed to comprehend the text. To what extent differences in prior knowledge or cultural schemata adversely affect the reading test performance of Hispanic children as compared to Anglo children is an area that deserves to be investigated.

How LEP children perform on different types of reading comprehension questions also needs to be documented. Few of the studies (see Troike, 1978; Willig, 1985) that have compared academic test performances in English of bilingually trained and nonbilingually trained Hispanic LEP children have reported the types of inferencing skills demonstrated by the children on the tests. This is not too unusual given that commercial test writers do not always delineate how they have defined comprehension, even though they may have included different types of questions on their tests (Pearson & Johnson, 1978; Trabasso, 1981). To know what a question actually is demanding of the reader,

Pearson and Johnson recommend that the test writer first determine how the information asked in the question is textually related to the information in the passage.

In a review of testing research, Durán (1983) reiterates Sánchez's (1934) earlier warning that Spanish-speaking children should not be tested in English without first ascertaining the extent to which the children are familiar with the English vocabulary employed on the test. Other researchers have noted that the reading comprehension of second-language readers seems to be more adversely affected by the semantic content of key vocabulary than does that of first-language readers (Clarke, 1979; Cziko, 1978; Perkins, 1983). This is an interesting finding given Langer's (1987) observation that the reading test performance of third-grade children in general is adversely affected by paraphrasing in the test questions. Thus, the extent to which second-language children differ from Anglo children in their interpretation of test vocabulary is another area that deserves to be explored.

If the test performance of Spanish-speaking Hispanic children is to be understood, then a variety of testing factors needs to be investigated. Studies related to the test performance of cultural-linguistic minorities suggest that knowledge of testing procedures (Tyler & White, 1979), test anxiety and test-wiseness (Rincón, 1980), differential perception of questions and answers (Au, 1981; Heath, 1982; Philips, 1972), and the testing event itself (Cicourel, 1974; Taylor, 1977) may affect reading test scores. In terms of Hispanic students, a speededness effect--the failure to complete all the items on a test due to prescribed time limitations--has been noted (Mestre, 1984; Rincón, 1980). Interestingly, this finding is supported by second-language research, which has observed that bilinguals (a) take longer to process either of the two languages, (b) tend to read at a slower rate in their second language, and (c) develop second-language receptive competencies more rapidly than productive competencies (Chamot, 1980; Eaton, 1980; Mägiste, 1979).

Another factor that may influence bilingual subjects' reading test performance in their second language is their first-language literacy development. Research by Barrera (1981) and Hudelson (1981) indicates that the psycholinguistic definition of the reading process (Goodman, 1978) is applicable to the Spanish reading of Hispanic children enrolled in bilingual education programs in the United States. Additional research with second-language learners already literate in their first language suggests that these students use their awareness of reading in one language to approach reading in the second language through the same psycholinguistic, hypothesis-testing procedure (Devine, 1981; Haddad, 1981; Hodes, 1981). How true this may be for Hispanic LEP children, who may or may not learn to read in Spanish first, and who typically receive reading instruction in English at a young age, still is relatively unknown. Cummins (1980, 1981) postulates that LEP children must develop a high level of cognitive literate proficiency in their dominant language before they can transfer the necessary comprehension strategies to second-language reading. On the other hand, Barrera (1984) and Hudelson (1984) argue that LEP children do not have to be orally proficient in their second language before they can read and write it.

The majority of the Hispanic children in this study had not been enrolled in a bilingual education program. A few had been enrolled, but were transitioned into English reading as early as second or third grade, suggesting limited reading proficiency in Spanish. Efforts to assess the transference of Spanish reading skills to English were not particularly fruitful due to the limited number and the nature of children who reported that they were proficient in Spanish reading (see García, 1988).

I designed this study to address the basic question of what factors influence Spanish-speaking Hispanic children's reading test performance in English. For comparative purposes, the study included a sample of Anglo children enrolled in the same classrooms as the Hispanic children.

Due to the exploratory nature of the topic under investigation, I used both qualitative and quantitative methodologies. Langer's (1987) study of how third-grade children answered items on standardized reading tests revealed that the children's answer choices did not always reflect their ongoing comprehension of the passages. Her research, along with the general lack of consensus regarding cultural test bias (Durán, 1983; Tyler & White, 1979), suggests that qualitative analysis needs to be

included so that unanticipated information relevant to both the quantitative analysis and to the children's test performance is not excluded. Accordingly, the qualitative analysis had the dual objectives of identifying factors that influenced the Hispanic children's test performance and eliciting information regarding their comprehension of the test. In the statistical analyses, the Hispanic and Anglo children's reading test performances were compared in terms of (a) the effect of time constraints, (b) the children's prior knowledge of the passage topics, and (c) the influence of the children's prior knowledge on their reading passage and question-type performances.

Method

Subjects

Fifth- and sixth-grade students from two elementary schools of similar socioeconomic status (low to low-middle) and in the same school district participated in the study. Although neither school housed a bilingual education program, substantial numbers of Hispanic students were in attendance at both schools. Of the 104 children for whom parental permission was granted, 51 were identified as bilingual (Spanish-English speaking) Hispanic children (26 fifth graders and 25 sixth graders) and 53 were identified as monolingual (English-speaking) Anglo children (31 fifth graders and 22 sixth graders). The subjects' ethnic identity and language use were determined by cross-referencing information provided by school personnel with the results of a self-reporting questionnaire that I administered to the students.

The majority of the children had attended school together for the past two years in integrated classrooms where the instruction was entirely in English. The Hispanic children were orally proficient in both English and Spanish and were not receiving any special services related to their second-language status. Standardized reading test scores in English on the California Tests of Basic Skills (CTB/McGraw-Hill, 1975) were available for 24 of the 25 Hispanic sixth graders (M = 42.3) and for 20 of the 22 Anglo sixth graders (M = 49.3). During the subsequent fall semester, standardized reading test scores in English on the Iowa Tests of Basic Skills were available for 21 of the 26 Hispanic fifth graders (M = 40.2) and for 23 of the 31 Anglo fifth graders (M = 55.1).

A subsample of 18 children (12 Hispanic and 6 Anglo) participated in retrospective, open-ended interviews regarding how they determined their vocabulary and reading test answers. Both groups of children were chosen in collaboration with their teachers to represent high, average, and low English readers. More Hispanic students than Anglo students were chosen for the interviews because the principal focus of the interviews was on understanding the reading test performance of Hispanic students. All of the Hispanic children selected had indicated on a self-reporting questionnaire that they could read in Spanish.

Materials

A vocabulary test, a prior knowledge test, and a reading comprehension test were administered to the children. The vocabulary test consisted of 64 vocabulary items. Thirty-two of the items were randomly selected from the subtests of three commercial vocabulary tests--the California Tests of Basic Skills, grade levels 2.5 to 4.9; and the Metropolitan Achievement Tests (Harcourt Brace Jovanovich, 1971), grade levels 3.5 to 4.9 and 5.0 to 6.9. The other 32 items, termed test-specific items, were selected from the reading test described below based on their importance to the comprehension of a specific passage or to the answering of a question. The students were instructed to write *yes* if they thought the underlined word was used correctly in the sentence, *no* if they thought the word was used incorrectly, and *dk* if they did not know the word, or could not decide. The children also were asked to circle any words on the test that they did not know.

In the examples below, the targeted word in the first question was considered to be test-specific because the students had to know the word title to answer several of the test questions. The targeted word in

the second question was not considered to be test-specific, because the word meadow was not in any of the passages or test questions and had been randomly selected from the commercial vocabulary tests:

___ 1. A title is the ending of a story.

___ 2. A meadow is a forest.

The prior knowledge test contained 8 multiple-choice questions related to each of the six reading passages for a total of 48 questions. Of the 8 questions, 4 were related to the general content of the respective passage and 4 were related to specific questions. For example, the information asked in Question 5 on the prior knowledge test was related to the students' general understanding of the chimpanzee passage but not directly related to specific information asked in any of the reading test questions:

5. The chimpanzee is
   a. a type of ape
   b. a cold-blooded mammal
   c. a ferocious lizard

Whereas Question 23 on the prior knowledge test assesses information that is explicitly addressed in Question 46 on the reading comprehension test:

23. Wild chimpanzees live in
   a. trees
   b. caves
   c. open grasslands

46. Chimpanzees live in
   a. deserts
   b. forests
   c. plains
   d. swamps

The reading comprehension test consisted of six expository passages, ranging from 160 to 400 words and divided into 4 to 7 paragraphs. Five of the passages were from commercial reading tests. All three of the expository passages on the California Achievement Test, 1970 edition, grade levels 4 to 6 were used (Canada, water as an erosive force, and chimpanzees). A less difficult passage about polar bears (grade level 4) from the California Achievement Test (CTB/McGraw-Hill, 1970), grade levels 2 to 4, was included as was a more difficult passage about the development of the first newspaper (grade level 6.9) from the California Tests of Basic Skills, 1975 edition. The commercial passages were chosen to present the students with expository passages that ranged in difficulty from slightly below their current grade level to slightly above their current grade level. Passages from older versions of the tests were selected so that none of the children would have read them before or were likely to encounter them in the near future. I wrote the sixth passage, a short description of piñatas (193 words), in an attempt to provide the Hispanic children with a reading passage specific to their culture.

The commercial passages initially were ordered according to their listed level of difficulty on the commercial reading tests, with the easier passages preceding the more difficult ones (e.g., polar bear, Canada, water, chimpanzees, and news) and with the piñata passage following the polar bear passage. After pilot-testing all of the materials with a small sample of Hispanic and Anglo children, the news passage was placed prior to the water and chimpanzee passages because the children in the pilot study found the latter two passages to be more difficult.

A total of 54 comprehension questions was asked, 9 on each passage. The actual comprehension questions on the commercial reading tests were used, so long as they could be categorized according to Johnston's (1981) adaptation of Pearson and Johnson's (1978) question-type taxonomy (wherein a question is considered *textually explicit* when the question and answer are paraphrased or found in a single sentence in the text; *textually implicit* when the question and answer are not paraphrased or found in a single sentence, but are in the passage; and *scriptally implicit* when only some of the information needed to answer the question, or a part of the question or answer, is presented in the passage). For each passage there were 3 textually explicit, 3 textually implicit, and 3 scriptally implicit questions. In some cases, additional questions were written or the original questions were modified. My assignment of questions to each of the three categories was corroborated by asking three other judges to independently classify the questions. The mean percentage agreement across the four judges was 94% for all three categories, 96% for the textually explicit category, 90.5% for the textually implicit category, and 96% for the scriptally implicit category.

Procedures

I administered the vocabulary and prior knowledge tests at the two schools in alternating weeks two weeks before the reading comprehension test was administered. Both the vocabulary and prior knowledge tests were read aloud to the children as they read them silently to themselves in order to compensate for problems some of the children might have had in reading. Completion of the vocabulary test took 15 minutes, while completion of the prior knowledge test took 20 minutes.

Two weeks later, the children at each school were given 42 minutes to silently read and complete the reading comprehension test. By referring to the amounts of time allowed on the commercial tests, I initially had estimated that 30 minutes would be the customary amount of time allowed to complete the test. I decided to give the students an additional 10 minutes in an attempt to offset the effect of speededness for the Spanish-speaking children. However, pilot-testing results with a small sample of Anglo and Hispanic children, who were from a higher socioeconomic level than the children in the major study, revealed that all but one of these children completed the test within the 30-minute time period. Based on these results, and to test for the effect of speededness, the children in the major study were instructed to use a pencil during the first 20 minutes of the reading test, a blue pen during the next 10 minutes, and a green pen during the final 12 minutes. This procedure was adapted from a technique used on the California Achievement Test to compute the total amount of testing time to be allotted.

As part of the qualitative analysis, each of the 18 children in the interview subsample participated in a retrospective interview with me either on the afternoon the child took the reading test or on the following day. The Hispanic children and I were free to use Spanish, English, or to code-switch in the interviews. These interviews were tape recorded and transcribed. The total number of minutes of individual interview data was approximately 720 minutes or 12 hours (the average was 40 minutes per child).

The interviews were open-ended and focused on how the children believed they approached and responded to the test items on the vocabulary and reading tests. The children's vocabulary and reading tests were placed in front of them, and reference was made to the tests throughout the interviews. The children were asked what they knew about a passage before they read it, what they remembered from reading the passage, if they liked the passage, if they thought the passage and questions were difficult or easy, and what made them difficult or easy. Part of the interviewing session was spent asking the children to explain how they determined their answers on a select set of test items, but much of what the children were asked depended on their respective vocabulary, prior knowledge, and reading comprehension test performances as well as on their own responses throughout the interviews. They were free to change their answers on the reading test and to reread passages if needed.

Scoring and Coding Procedures

Statistical analysis. The reading test scores used to test for the effect of time constraints were computed as the cumulative number of reading comprehension test items answered correctly by the end of each of the three time periods. The prior knowledge scores used to test for differences in the children's prior knowledge of the reading topics were the number of prior knowledge items answered correctly for each topic. The reading passage scores used to compare their passage performance were calculated as the number of correct answers per passage on the reading comprehension test. The question-type scores used to compare their question-type performances were the number of correct answers per question type on the reading comprehension test. Finally, the overall prior knowledge scores used in the covariate analyses were the total number of items that the children answered correctly on the prior knowledge test.

Qualitative analysis. Although the teachers' ranking of the Anglo students as high, average, and low readers was consistent with the Anglo students' English reading test performance, their ranking of the Hispanic students was inconsistent. None of the Hispanic students scored as high as the highest scoring Anglo students. In addition, several of the Hispanic children scored higher on the reading test than their teachers had ranked them while others scored lower. Consequently, the children's performances were not compared according to teacher ranking but instead were compared according to how well the children scored on the reading test relative to other children in their respective group. Three of the 12 Hispanic children interviewed were high scorers, 5 were average, and 4 were low. On the other hand, 2 of the 6 Anglo children were high scorers, 2 were average, and 2 were low.

The interview transcripts were color coded according to the different types of information that emerged from the data. The major categories of information that appeared to be salient were test-taking strategies, attitudes, anxiety, prior knowledge, comprehension, language preference, metacognitive awareness, and reaction to vocabulary (see García, 1988). The children's discussion of reading test questions was color coded according to whether the items were textually explicit, textually implicit, or scriptally implicit. Information that could be subsumed under the major categories of information and the question-type headings was organized by group (Anglo or Hispanic) and within group by the child's level of reading test performance (high, average, low) and put into separate files on a microcomputer. Factors that affected the children's test answers but that were not particular to the question type (e.g., syntax, vocabulary, or discourse) were deleted from the question-type files and put into their own category or subsumed under another name.

Each child's respective test performance on the vocabulary, prior knowledge, and reading test was summarized and recorded on index cards. The children's interview responses were compared to their individual performances by using the index cards.

Throughout the coding and analyzing process, the interview responses were compared and analyzed in terms of the children's individual performances, the group's performance (Hispanic or Anglo), and the level of the child's reading test performance within the group (e.g., high, average, low). Propositions that emerged from the observed data were organized into "conceptual categories" and evaluated with respect to their "regularities and irregularities" (Saville-Troike, 1985), taking into account both positive and negative cases (Taylor & Bogden, 1984).

Results

Quantitative Findings

Effect of time constraints. One of the research questions investigated was whether the Hispanic children's performance on the reading comprehension test would significantly improve relative to the Anglo children's performance when the amount of time given them to complete the test was augmented.

A three-way analysis of variance was performed with group (Hispanic and Anglo), grade (fifth and sixth), and time (20 minutes, 30 minutes, and 42 minutes) as the independent variables, with repeated measures on time. There was a significant between-subjects difference due to group, $F(1,100) = 5.43$, $p < .0218$, with Anglos ($M = 40.9$) performing better than Hispanics ($M = 37.2$), and a significant main effect for time, Huynh-Feldt Epsilon's adjusted $F(2,200) = 93.81$, $p < .0001$. However, the interaction of major interest, Time by Group, proved not to be significant, Huynh-Feldt Epsilon's adjusted $F(2,200) = .03$, nor was there a significant three-way interaction involving time, group, and grade, $F(2,200) = .78$. The findings indicated that Hispanics and Anglos alike improved similarly with increases in time, with the Anglos performing significantly better than the Hispanics at the end of each time period.

Differences in prior knowledge. The second research question addressed was whether the Hispanic and Anglo children would significantly differ in their prior knowledge of the topics on the reading comprehension test, with the Hispanic children knowing more about a culturally appropriate topic relative to the other topics. A multivariate analysis of variance (MANOVA) on the six prior knowledge topic scores with group and grade as independent variables revealed a significant multivariate effect for group, Wilk's criterion $F(6, 95) = 6.35$, $p < .0001$, indicating that there was an overall difference in topic knowledge between the Hispanics and Anglos, with the Anglos knowing more.

Discriminant analysis was performed to determine the optimal linear combination of prior knowledge topics that would differentiate the most between the Hispanic and Anglo groups. Examination of the standardized canonical weights for prior knowledge in Table 1 and of the group means by prior knowledge in Table 2 reveals that the students' performance on the prior knowledge topics was differentiated the most by the piñata topic, with the Hispanics scoring higher, and by the Canadian and chimpanzee topics, with the Hispanics scoring lower. The canonical weights for the news, erosion, and polar bear passages were less than half of the absolute value of the highest canonical weight (piñata), and, therefore, judged to have contributed only minimally to the differentiation of groups on the prior knowledge topics (Tatsuoka, 1970).

[Insert Tables 1 and 2 about here.]

Differences in passage performance. A third research question investigated was whether differences in the Hispanic and Anglo children's performances on the individual passages would be accounted for by differences in their overall prior knowledge. A MANOVA on the reading passage data with group and grade as independent variables indicated that a multivariate effect for group on the six passages was statistically significant, Wilk's criterion $F(6, 95) = 2.23$, $p < .0463$, with the Hispanics scoring poorer. Examination of the standardized canonical weights produced by discriminant analysis on the reading passage data in Table 1 and of the reading test group means by passage in Table 2 reveals that the group performance by passage was differentiated primarily by the chimpanzee passage, with the Hispanics scoring lower.

On the other hand, a multivariate analysis of covariance (MANCOVA) computed on the reading passage data with group and grade as the independent variables and the prior knowledge test score as the covariate did not result in a significant multivariate effect for group, Wilk's criterion $F(6, 96) = 1.25$, $p < .2886$. This meant that when prior knowledge differences were taken into account, there were no significant differences in passage performance between the two groups.

Differences in comprehension as measured by question type. Another research question raised was to what extent the children's prior knowledge scores would account for differential group performance on the three question types. It was expected that the Hispanic children's performance on scriptally implicit questions, which require the use of content from the passage as well as background knowledge, would be more strongly related to their prior knowledge test scores than would their performance on textually explicit or textually implicit questions.

A MANOVA on the question-type data with group and grade as independent variables revealed a significant multivariate effect for group, Wilk's criterion $F(3, 98) = 5.43, p = .0017$, indicating that there was a difference in question-type performance between the two groups, with the Hispanics scoring poorer. Examination of the standardized canonical weights produced by discriminant analysis on the reading comprehension question-type data in Table 3 and of the group means on question type in Table 4 indicates that the scriptally implicit questions differentiated the most between the two groups, with the Hispanic students scoring more poorly on these questions. The canonical weight for the textually implicit questions was less than half of the absolute value of the highest canonical weight, suggesting that differentiation between the two groups on this question type was minimal.[1] There was no significant differentiation in group performance on the textually explicit questions.

[Insert Tables 3 and 4 about here.]

When a MANCOVA was performed on the question-type data with group and grade as the independent variables and the prior knowledge test score as the covariate, the significant multivariate effect for group remained, Wilk's criterion $F(3, 97) = 3.58, p < .0167$. Examination of the standardized canonical weights produced by discriminant analysis on the question-type data after prior knowledge was controlled in Table 3 and of the adjusted means in Table 4 indicates that when prior knowledge was controlled, the multivariate effect still was mostly due to the group difference on scriptally implicit questions, with the Hispanic children continuing to perform more poorly on these questions as compared to the Anglo children. The adjusted means in Table 4 suggest that when prior knowledge was controlled, the two groups did equally well on the textually explicit and implicit questions. Separate univariate analyses of variance on question type with group and grade as independent variables and prior knowledge as the covariate confirmed these findings. For example, with prior knowledge as the covariate, the textually explicit model was significant, $F(4,99) = 15.56, p < .0001$, with prior knowledge as the only significant source of variance, $F(1,99) = 58.22, p < .0001$. Similar results were found for the textually implicit model, $F(4,99) = 12.23, p < .0001$, with prior knowledge again the only significant source of variance, $F(1,99) = 38.21, p < .0001$.

Qualitative Findings

For the purposes of this study, the children's interview responses are analyzed below under the following headings: effect of time constraints, effect of vocabulary familiarity, effect of prior knowledge, effect of test-wiseness, and assessment of reading comprehension. In the dialogue, my utterances are preceded by an *I*, whereas the children's utterances are preceded by the first letter of their first names.

Effect of time constraints. Examination of the interviewed children's reading comprehension test performance under the three time periods along with their interview protocols suggests that the Hispanic children in the subsample needed more time to complete the test than the Anglo children and that without the additional time offered, some of their scores might have been much lower. First of all, a greater proportion of Hispanic children (8 out of 12) than Anglo children (3 out of 6) used the additional time offered in the second period, and 5 Hispanic children as compared to 1 Anglo child used the time in the third period. Secondly, the number of questions attempted in the first period by Hispanic children who used the second period ranged from a low of 22 questions to a high of 45 (out of a total of 54). The range for the Anglo children was much higher, from a low of 37 to a high of 53. By the end of the second period, the lowest number of questions answered by any of the Anglo children was 53 as compared to 27 for the Hispanic children. Thirdly, at least 4 of the 8 Hispanic children who

[1]Univariate analyses of variance performed for each of the question types with group and grade as independent variables revealed that the *F* ratio for the textually implicit model was nearly significant, $F(3, 100) = 2.60, p < .0561$, with group as a significant source of variance $F(1, 100) = 4.37, p < .039$. However, this model was not significant when judged by the Bonferroni protected *F* level of .015.

used additional time changed their test-taking strategies when they thought they were running out of time, with 3 of them (2 average scorers and 1 high scorer) ceasing to read the passages altogether.

How quickly the Hispanic children finished the test seemed to depend on the general approach they used, how often they referred back to the passages for their answers, and if they changed their approach as the test became more difficult or when they thought they were running out of time. The 4 Hispanic children who finished in the first time period said that they answered most of the questions based on what they thought they had remembered, only referring back to the passages if they could not remember the answer. Only 1 Hispanic child, Gerry (G), a high scorer, appeared to do this successfully, correctly answering 43 of the 54 questions in the first time period:

I When you take a reading test like this, what do you do, how do you choose your answers?
G By remembering.
I Mainly what you remember after you read it? Is that how you do it?
G Um, if I don't remember I come back and look.

How frequently the other Hispanic children referred back to the passages seemed to vary. Olivia (O), a low scorer, considered it disadvantageous to look back in the passages because she thought that this strategy took too much time:

I What seemed to make the difference as to whether you looked or not?
O It's more better to know them than to look back.
I Why's that?
O It takes more time.

The Hispanic children who used all three time periods (2 high scorers and 2 average scorers) appeared to be more diligent in looking for the answers. On a difficult passage, Mary (M), a high scorer, said that she read the passage slowly, and then referred back to the passage twice to find the answers:

M When I started reading it [Canadian passage], I went, I tried to read it slowly so I could understand what they meant and then when I had to go to the answers, I had to go back twice.

However, when Roberto (an average scorer) only had 10 minutes left in the third period to read the last two passages and answer 18 questions, he ceased to read the passages and stopped looking for the answers:

R This one [erosion passage], I didn't kind of read it all. I thought I knew the answers.
. . .
R This one, the last one like [chimpanzees], I only read up to here, and then I answered them.

If more time had been available, he might not have changed his test-taking strategies, possibly attaining a higher score.

Effect of vocabulary familiarity. The interview data revealed that the Hispanic children knew far less of the vocabulary on the test than that measured by the test-specific vocabulary measure. For instance, the Hispanic students identified 24 content words that they did not know on the Canadian test passage, a passage of approximately 180 words with 9 test questions. Half of the Hispanic children missed Question 22, a textually implicit question, while none of the Anglo children missed it:

22. A serious handicap for growth in trade is
    a. a lack of streams
    b. few harbors

c. icebound harbors
d. overproduction

Although the answer to this question ("c") was given in two adjacent sentences in the passage, the 6 Hispanic children who missed it did so because they did not know what *icebound* meant and they misinterpreted *handicap*. As Luz put it, "I know the word handicapped, but I don't know what it's talking about." Once the word *icebound* was defined for them, they could identify it as the correct answer. However, as Evita's (E) explanation of her answer demonstrates, the Hispanic children still were thinking of *handicap* as an adjective and only in reference to handicapped people:

I Why would that be a problem?
E Porque los handicapped no pueden pasar por allí [Because the handicapped can't go through there].
E ¿Cómo pasear un niño por allí? Tendrá que balancearse [How could a child walk through there? He would have to balance himself].

They also were affected by the way some words were used in their speech community. On the vocabulary test, 10 out of the 12 Hispanic children disagreed with the use of *advantage* in the sentence, "An advantage is something that is helpful." In discussing its usage, it became apparent that the Hispanic children were disregarding its use in the sentence as a noun and interpreting advantage to mean *aprovecharse de*, a verb, which in English means "to take advantage" and which also is synonymous in Spanish with *abusar de* (to abuse) and *engañar* (to cheat). Seven of the 12 Hispanic children missed Question 27, a textually implicit question, while none of the Anglo children missed it:

27. One advantage that Canada has is
    a. a large population
    b. lots of tourists
    c. a good railroad system
    d. natural resources

Once again, the answer ("d") could have been determined from the passage, but did require the children to synthesize information across the paragraph. Most of the Hispanic children who missed the question did not think that it was answered in the passage and answered it without making reference to the passage content. In fact, Evita translated the question and her answer ("b") as "Un abuso que la Canadá tiene es mucha gente visitándolo" [An abuse that Canada has is many people visiting it]." Later in the interview, when she was asked if she thought Canada was a rich or a poor country, she revealed how she had been interpreting her answer to Question 27:

E Parece muy rico porque la gente, porque no hacen tan pobres . . . porque allí venden papeles. ¿Sabe lo que le digo? [It seems rich because the people, because they aren't so poor . . . because they sell papers there. Do you know what I am telling you?]. . .
E Porque como los mejicanos no tienen papeles [de inmigración] van a la Canadá para comprar papeles y por eso son ricos [Because since the Mexicans don't have immigration papers, they go to Canada to buy them and for this reason they are rich].

In addition to the presence of unknown vocabulary in the passages, and to the misinterpretation of known vocabulary, the Hispanic children's reading test performance was further complicated by paraphrasing in the questions and in the answer choices. Unlike the Anglo children--who generally recognized the paraphrased questions or answers, the Hispanic children frequently assumed that the paraphrased questions or answer choices were not from the passages. For example, only 1 of the 6 Anglo children missed Question 43, a textually implicit question, while 8 of the 12 Hispanic children missed it:

43. A river runs swiftly in its high areas because
    a. it is steep and narrow and has a nearly direct course
    b. it is wide and leaves heavy material behind
    c. sediment and rocks block the water
    d. the banks are low and very irregular

A number of the clues in the passage were paraphrased in the question--*swiftly* for *fast-running, high areas* for *upper course of the river, direct* for *straight*. Gerry, a Hispanic high scorer, said that he did not think that the answer had been given in the passage, so he tried to figure out the answer based on his interpretation of the information in the question stem. He chose "c" as his answer instead of the correct answer "a" because he thought that *swiftly* meant *smoothly*:

G Because when there's things blocking the water, the water goes another way.
I Why would it go, what does swiftly mean?
G Smoother.

When the questions and answer choices were translated into Spanish, then some of the Hispanic children who had chosen the incorrect answers were able to answer the questions correctly. For example, José missed Question 48, a textually implicit question, because he did not think that the answer was in the passage, and guessed by choosing "a" instead of the correct answer "c":

48. In their native environment, chimps
    a. hide in the daytime
    b. live alone
    c. roam freely
    d. stay in one place

The terms used in the passage for *native environment* were *freedom* and *free state*. When I translated *native environment* into Spanish, then José (J) correctly chose the answer:

I Eso quiere decir ambiente natural [This means natural environment].
J (pause) Roam freely.

Effect of prior knowledge. Some of the Hispanic children also had difficulty comprehending some of the passages because they did not understand the foci of the passages. When I asked one of the Hispanic children if he thought the erosion passage was easy or difficult to read, he replied that it was difficult because "I don't know nothing about volcanoes." Another child asked if a chimpanzee was a chipmunk. In a sense, the authors of these passages assumed that the children knew what erosion and chimpanzees were because these terms were not defined in the passages.

The Hispanic children's incorrect answers on the Canadian, erosion, and chimpanzee passages frequently suggested that they had interpreted the questions and answer choices in accordance with inappropriate or less developed schemata. For instance, Jaime chose answer "a" for Question 50, a scriptally implicit question, instead of answer "b":

50. The greatest threat to the survival of the chimpanzee is
    a. antelopes
    b. humans
    c. monkeys
    d. termites

When I asked him to explain his answer, he said, "I heard about antelopes eating monkeys."

Effect of test-wiseness. The interview data indicated that to a certain extent all of the children, with the exception of the high-scoring Anglo children, were adversely affected by their inability to recognize the different textual relationships implicit in the questions. For example, on the textually explicit questions the low-scoring Anglo children's responses suggested that they relied more on their reasoning abilities and prior knowledge to discriminate among the distractors than they did on remembering what they had specifically read or on referring back to the passages. Even though the correct answer to Question 29 was stated in a sentence in the passage, "Newspapers would have been impractical in those days because most people could not read," Sam (an Anglo low scorer) chose "c" rather than "a":

29. Why would newspapers have been impractical in earlier times?
    a. Most people could not read
    b. Paper had not been invented yet
    c. No one had enough money to buy them
    d. People preferred the town criers to newspapers.

Although Sam's (S) answer may appear logical, the topic of money was not even mentioned in the passage:

S Cause in 1609 there wasn't a lot of money.

In another example, Kitty (K) another Anglo low scorer, missed Question 38:

38. The Grand Canyon was created by
    a. the force of earthquakes
    b. rains and river water
    c. volcanic eruptions
    d. the build up of silt deposits

Again, the correct answer was given in a sentence in the passage, "Rains and the Colorado River created the Grand Canyon." Nevertheless, she chose "a" as her answer. In the interview, she indicated that she based her answer on what she thought could have created the Grand Canyon:

K Cause all the rocks in the ground shakes them loose

Despite the low- and average-scoring Anglo children's lack of test-wiseness, however, they frequently answered the different types of questions correctly because they were familiar with key vocabulary used in the test questions and had the appropriate prior knowledge. For example, a comparison of how the Anglo and Hispanic low scorers determined their answers to the textually implicit questions indicated that the Anglo low scorers sometimes determined their answers by locating clues in the passages, while other times they relied on what they thought they knew about the topic. In contrast, the Hispanic low scorers usually said that they could not find clues for these questions in the passages, and therefore, almost always attempted to use their prior knowledge to determine their answers. The average-scoring Anglo students appeared to be more successful in determining their answers to the scriptually implicit questions because they were more adept at recognizing the paraphrasing in the test questions--enabling them to combine clues in the passage with what they already knew about the topic--or because they had the appropriate prior knowledge to make an educated guess.

It should be noted that an analysis of the Hispanic children's responses to all three types of questions revealed that they missed more questions regardless of the question type when the questions deviated from the passages (either due to paraphrasing or inferencing requirements). For example, Cathy (C), a Hispanic high scorer, said that she looked for the answer ("a") to Question 3, a scriptually implicit question, but that she could not find it:

3. A polar bear's hairy feet are especially useful on
   a. ice and snow
   b. rocky ground
   c. sandy beaches
   d. sharp stones

She did not seem to realize that she was supposed to base her answer on related information in the passage regarding the weather and terrain (*frozen north*, *winter*, *snow*), and chose "b" based on her own logic:

C Well, they probably, they probably are hairy in case they step on hard, pointy rocks or something so they won't hurt their feet.
I So, you didn't look for it? You just sort of figured it out?
C Well, I couldn't find it.

When the low- and average-scoring Hispanic children did not recognize the clues or could not find the exact answers in the passages, they often chose answers that were incorrect but that had been mentioned in the passages. When I suggested to one child that more than one answer might have been correct, he replied that if that was so, it would have been listed in the passage:

J Because if it did, if it was, it would say so . . . .

This emphasis on literality was characteristic of the low- and average-scoring Hispanic children's approach to all three types of questions. It was not a general characteristic of the low- and average-scoring Anglo children's approach.

Assessment of reading comprehension. The Hispanic children's explanations of how they answered the questions and their replies to some open-ended questions asked orally regarding the content of the test passages suggested that they had comprehended the intent of some of the questions even though they had missed them. Gerry (G), a Hispanic high scorer, missed Question 25, a scriptally implicit question, because he did not realize that the answer ("c") was paraphrased in the passage and chose "d" instead, even though he did not know what *landlocked* meant:

25. Which of the following statements does this article suggest?
   a. Canada has a profitable cotton industry
   b. Canada has few fur-bearing animals
   c. Canada has many unsettled areas
   d. Canada is a landlocked area

In explaining his answer, he pointed out that he knew that "b" was incorrect, "Cause this ain't true. It has a lot of them," but that he could not find information in the passage related to the other answer choices:

G Yeah, I went back and looked but I couldn't find anything on it.

His answer to a general question about Canada revealed that he not only comprehended the information tested in Question 25 but that he also comprehended the passage:

I Would you call Canada a rich or a poor country?
G Rich.
I Why?
G Cause a lot of resources to mine and . . .
I Do they have a lot of people?

G Oh, no, not a lot of people.
I How do you know that?
G Cause it says in here they have a small population.

General Discussion

Without further analysis of the Hispanic children's reading test scores, the test results would simply indicate that the Hispanic children scored significantly lower than their Anglo counterparts. However, the prior knowledge assessment reveals that with the exception of the piñata and polar bear passages, the Hispanic children knew less about the other passage topics prior to reading the passages than did the Anglo children. These findings tend to confirm Royer and Cunningham's (1981) argument that diverse topics do not necessarily reduce the cultural loading of standardized tests. Although the Hispanic children did not perform significantly better than the Anglo children on the piñata and polar bear passages, they also did not perform worse, as they did on some other passages. It also should be noted that their performance on the textually explicit and textually implicit questions was not significantly different from that of the Anglo children.

Two aspects of the reading test were identified in the statistical analysis as contributing to the Hispanic children's lower performance: their performance on the last passage and their performance on the scriptally implicit questions. A qualitative analysis of how some of the Hispanic children approached the test suggested that these children needed more time to finish it. Because many of them felt that they were running out of time, they answered the questions toward the end of the test without reading the passages. Because they knew significantly less about the chimpanzee topic, many of their answers were erroneous. In fact, when the Hispanic children's total prior knowledge scores were taken into account in the statistical analysis, then differences in their passage performance disappeared.

On the other hand, differences in the children's performance on the scriptally implicit questions did not disappear when prior knowledge differences were controlled, suggesting that there were factors other than prior knowledge that affected the Hispanic students' scriptally implicit performance. The interview data revealed that the Hispanic children frequently missed these questions for reasons that did not always imply faulty inferencing. All of the Hispanic students were misled by the paraphrasing in the questions and answers. They generally did not recognize the textual relationship inherent in the scriptally implicit questions, and many of them tried to utilize a literal interpretation of the text to determine their answers.

To have used the Hispanic students' reading test scores to evaluate their reading ability would have seriously underestimated their reading comprehension potential. The Hispanic children's interview responses about how they determined their answers and their responses to open-ended comprehension questions asked orally tended to elicit more information about their passage comprehension than did their actual performance on the test. This study, along with other research that has looked at Hispanic students' oral reading performance (Miramontes, 1990), suggests that educators need to understand the unique factors that may affect the reading performance of second-language students so that they can use this information to provide more effective evaluation and instruction.

The interview data specifically demonstrated that the presence of unknown vocabulary in the questions and answer choices was the major linguistic factor that adversely affected the Hispanic children's reading test performance. In some cases, the Hispanic children showed that they had comprehended the test passages, but had not comprehended the questions due to problems with vocabulary. When the questions and answer choices were translated into Spanish, then some of the Hispanic children who had chosen the incorrect answers were able to answer the questions correctly. This finding is consistent with other second-language research that has shown that second-language students frequently produce longer and more accurate recalls of second-language text when they are allowed to use their first language (Eaton, 1980; Lee, 1986).

The Hispanic children's use of Spanish to interpret English vocabulary and to comprehend aspects of the English test passages also indicates that their knowledge of Spanish should not be overlooked if their acquisition of English literacy skills is to be enhanced in the all-English medium classroom. This is an important finding given that most LEP children enrolled in all-English medium classrooms do not receive second-language services by virtue of the fact that they are considered to be orally proficient in English.

The findings suggest that further research needs to be undertaken in order to understand why Hispanic children enrolled in the same classrooms as Anglo children and of the same socioeconomic level not only know less about the range of topics included on standardized tests but also are not accustomed to making the types of inferences needed to answer scriptally implicit questions. The tendency of the low- and average-scoring Hispanic students to rely on a literal interpretation of the text to determine their test answers might well have been the result of differential instruction, which has been documented in studies of low and high reading groups (see Allington, 1980; Collins, 1983). Research by Moll, Estrada, Diaz, and Lopes (1980) already has demonstrated that English reading teachers may be misinterpreting bilingual children's non-native pronunciation as a symptom of decoding problems. If Hispanic children are placed in low reading groups due to their non-native pronunciation of English, and if this instruction teaches them to focus on a literal interpretation of the text, then reading tests that devalue this skill are penalizing these children for what they have learned. This, in a sense, is an additional type of test bias of which policymakers need to be aware. Furthermore, this finding suggests that the curriculum and teaching strategies employed with LEP children and the placement of such children in low reading groups due to their non-native-like pronunciation need to be reexamined.

The extent to which second-language children need more time to complete reading tasks such as those found on reading tests also needs to be researched further. All of the Hispanic children in the interview subsample had said that they could read in Spanish. Although the quantitative findings did not indicate that the Hispanic children in the larger sample improved their reading test performance relative to that of the Anglo children when they were given more time to complete the test, the interview data did suggest that the Hispanic children in the subsample would have scored much lower on the test if they had not had additional time. This is an interesting finding given that other researchers have observed that bilinguals not only tend to read at a slower rate in their second language but also generally take longer than monolinguals to process either of the two languages (Chamot, 1980; Eaton, 1980; Mägiste, 1979). When the effect of time constraints was tested in the larger sample, the Hispanic children's ability to read in Spanish was not taken into account.

Because assessment of children's prior knowledge does not necessarily reveal what they are capable of comprehending when they do have the appropriate prior knowledge, it seems important for additional research to explore how Hispanic children comprehend culturally familiar and unfamiliar test passages at various difficulty levels. Such research should also examine the types of strategies and skills that Hispanic children utilize in reading culturally familiar and unfamiliar passages in both Spanish and English. These recommendations, along with the finding that some of the Hispanic students in the interview subsample used Spanish to interpret the test, suggest that informal assessment techniques, where bilingual students are given an opportunity to discuss what they have read in their two languages or to code-switch may be an effective way to assess their reading comprehension (García & Pearson, in press). As Miramontes (1990) has pointed out, the language use of Hispanic students varies considerably, depending on the topic, the context of the interaction, the student's language proficiency and language experience.

Finally, it should be noted that the use of commercial reading achievement tests for placement or assessment purposes has been critiqued because it is difficult to know from such tests why any individual child does poorly (Johnston, 1981, 1984; Royer & Cunningham, 1981). In an attempt to disentangle the contributions of children's prior knowledge, reading strategies, and reasoning skills to their overall comprehension scores, new statewide tests have been developed in both Illinois and Michigan (Pearson,

Valencia, 1987; Wixson, Peters, Weber, & Roeber, 1987). Based on a constructivist view of reading comprehension, the latter tests provide children with longer, noncontrived passages; assess their prior knowledge of the passage topics; ask questions based on an inferencing taxonomy; and evaluate children's awareness of reading strategies. While these new tests may be more directly related to our current understanding of the reading process, they do not help us to identify or understand the relationship between second-language children's reading test performance and literacy development. This still is an area that needs additional research.

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Table 1

Standardized Canonical Weights for the Discriminant Function on Group Effect for Prior Knowledge and Reading Comprehension by Passage (N = 104)

Passage	Prior Knowledge[a]	Reading Comprehension[b]
Polar Bear	-.1979	-.5605
Piñata	-.7842	-.2327
Canada	.4883	.0914
News	.3234	.0469
Erosion	.2013	.1537
Chimpanzee	.4004	.9891

[a]Canonical correlation with group membership = .5350

[b]Canonical correlations with group membership = .3517

Table 2

Group Means (and Standard Deviations) on the Prior Knowledge and Reading Comprehension Tests by Passage

Passage	Prior Knowledge Test[a]		Reading Comprehension Test[b]	
	Hispanic (n = 51)	Anglo (n = 53)	Hispanic (n = 51)	Anglo (n = 53)
Polar Bear	6.1 (1.17)	6.3 (1.29)	8.1 (1.43)	8.2 (1.06)
Piñata	6.9 (0.89)	6.3 (1.08)	8.1 (1.27)	8.3 (.92)
Canada	4.5 (1.71)	5.7 (1.83)	5.8 (2.03)	6.5 (1.87)
News	3.8 (1.49)	4.5 (1.67)	5.9 (2.13)	6.5 (2.18)
Erosion	3.6 (1.34)	4.3 (1.67)	4.4 (1.82)	5.3 (2.47)
Chimpanzee	4.7 (1.52)	5.8 (1.54)	4.8 (1.87)	6.2 (2.28)

[a]Maximum score possible is 8.

[b]Maximum score possible is 9.

Table 3

Standardized Canonical Weights for the Discriminant Function on Group Effect for Reading Comprehension by Question Type (N = 104)

Question Type	Reading Comprehension[a]	Reading Comprehension with Prior Knowledge as a Covariate[b]
Textually Explicit	-1.0758	-1.5336
Textually Implicit	.4718	.5578
Scriptally Implicit	1.3667	1.4053

[a]Canonical correlation with group membership = .3157.

[b]Canonical correlation with group membership = .3157.

Table 4

Group Means and Adjusted Group Means (with Standard Deviations and Standard Errors) on the Reading Comprehension Test by Question Type

Question Type[a]	Mean Scores		Adjusted Mean Scores[b,c,d]	
	Hispanic (n = 51)	Anglo (n = 53)	Hispanic (n = 51)	Anglo (n = 53)
Textually Explicit	13.4 (2.61)	14.1 (3.19)	13.9 (.33)	13.6 (.33)
Textually Implicit	12.5 (2.98)	13.8 (3.26)	12.9 (.38)	13.3 (.38)
Scriptally Implicit	11.3 (2.47)	13.1 (2.87)	11.8 (.32)	12.7 (.31)

[a]Maximum score possible is 6.

[b]With prior knowledge as a covariate.

[c]Least square means.

[d]Standard error.